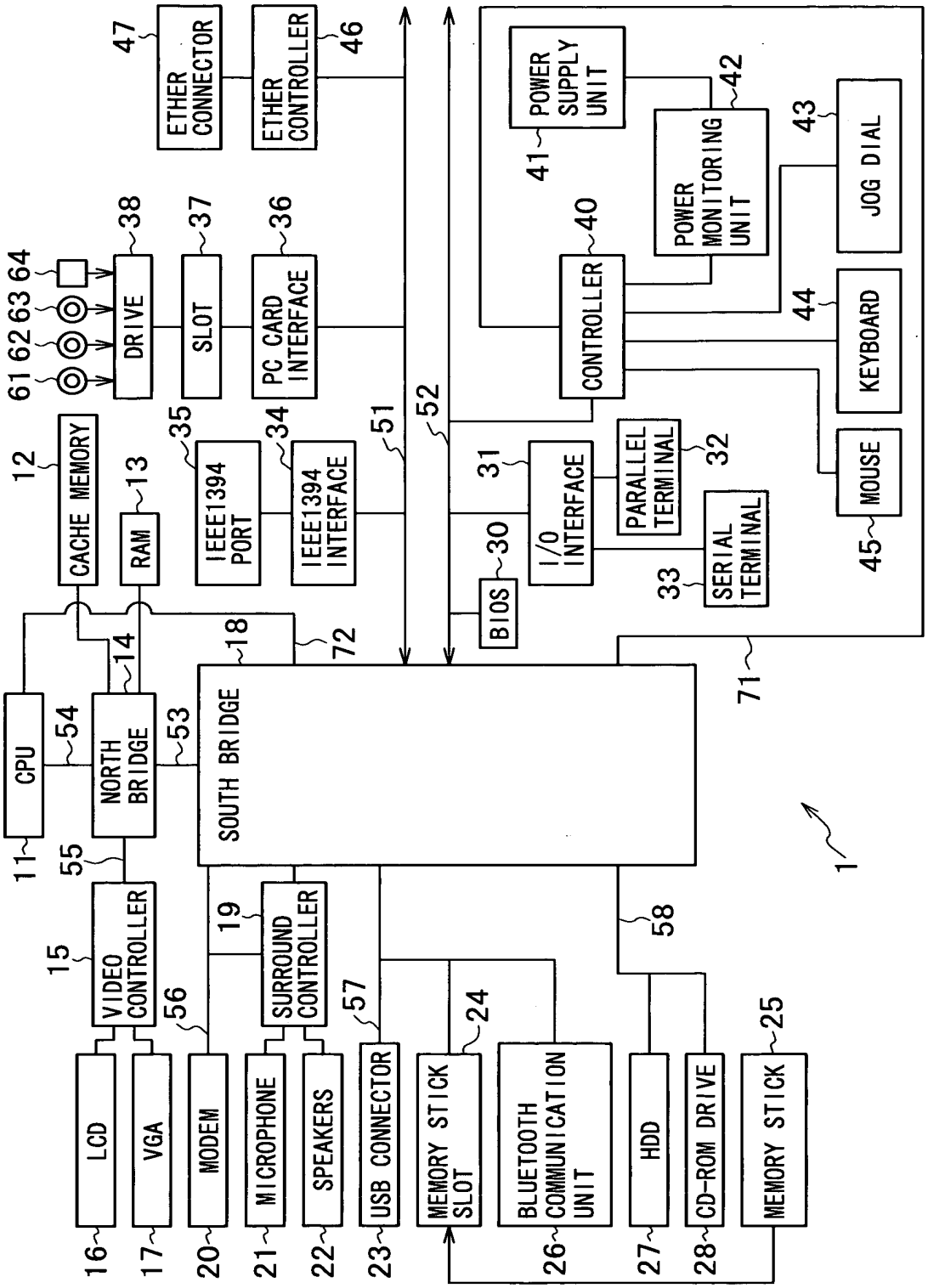
FIG. 1


CPU
NORTH BRIDGE
SOUTH BRIDGE
CACHE MEMORY
RAM
VIDEO CONTROLLER
LCD
VGA
MODEM
MICROPHONE
SURROUND CONTROLLER
SPEAKERS
USB CONNECTOR
MEMORY STICK SLOT
BLUETOOTH COMMUNICATION UNIT
HDD
CD-ROM DRIVE
MEMORY STICK
IEEE1394 PORT
IEEE1394 INTERFACE
DRIVE
SLOT
PC CARD INTERFACE
ETHER CONNECTOR
ETHER CONTROLLER
BIOS
I/O INTERFACE
PARALLEL TERMINAL
SERIAL TERMINAL
POWER SUPPLY UNIT
POWER MONITORING UNIT
CONTROLLER
KEYBOARD
MOUSE
JOG DIAL
11
12
13
14
15
16
17
18
19
20
21
22
23
24
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41
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51
52
53
54
55
56
57
58
61
62
63
64
71
72
1

FIG. 2

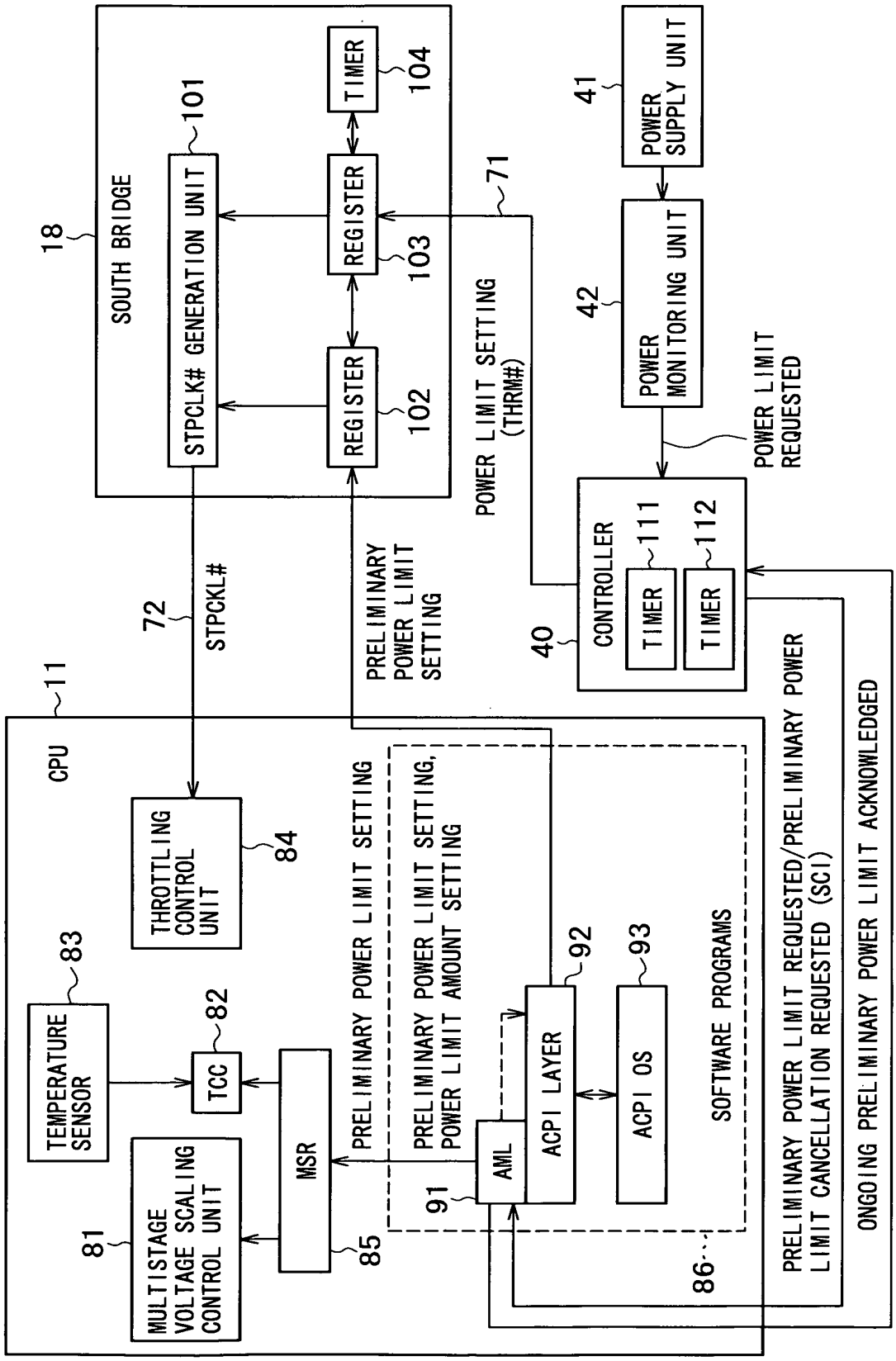

SOUTH BRIDGE
18
STPCLK# GENERATION UNIT
101
REGISTER
102
REGISTER
103
TIMER
104
71
POWER LIMIT SETTING (THRM#)
41
POWER SUPPLY UNIT
42
POWER MONITORING UNIT
POWER LIMIT REQUESTED
CONTROLLER
40
TIMER
111
TIMER
112
72
STPCKL#
PRELIMINARY POWER LIMIT SETTING
CPU
11
THROTTLING CONTROL UNIT
84
TEMPERATURE SENSOR
83
TCC
82
MSR
85
MULTISTAGE VOLTAGE SCALING CONTROL UNIT
81
PRELIMINARY POWER LIMIT SETTING, POWER LIMIT AMOUNT SETTING
91
AML
ACPI LAYER
92
ACPI OS
93
SOFTWARE PROGRAMS
86
PRELIMINARY POWER LIMIT REQUESTED/PRELIMINARY POWER LIMIT CANCELLATION REQUESTED (SCI)
ONGOING PRELIMINARY POWER LIMIT ACKNOWLEDGED

FIG. 3

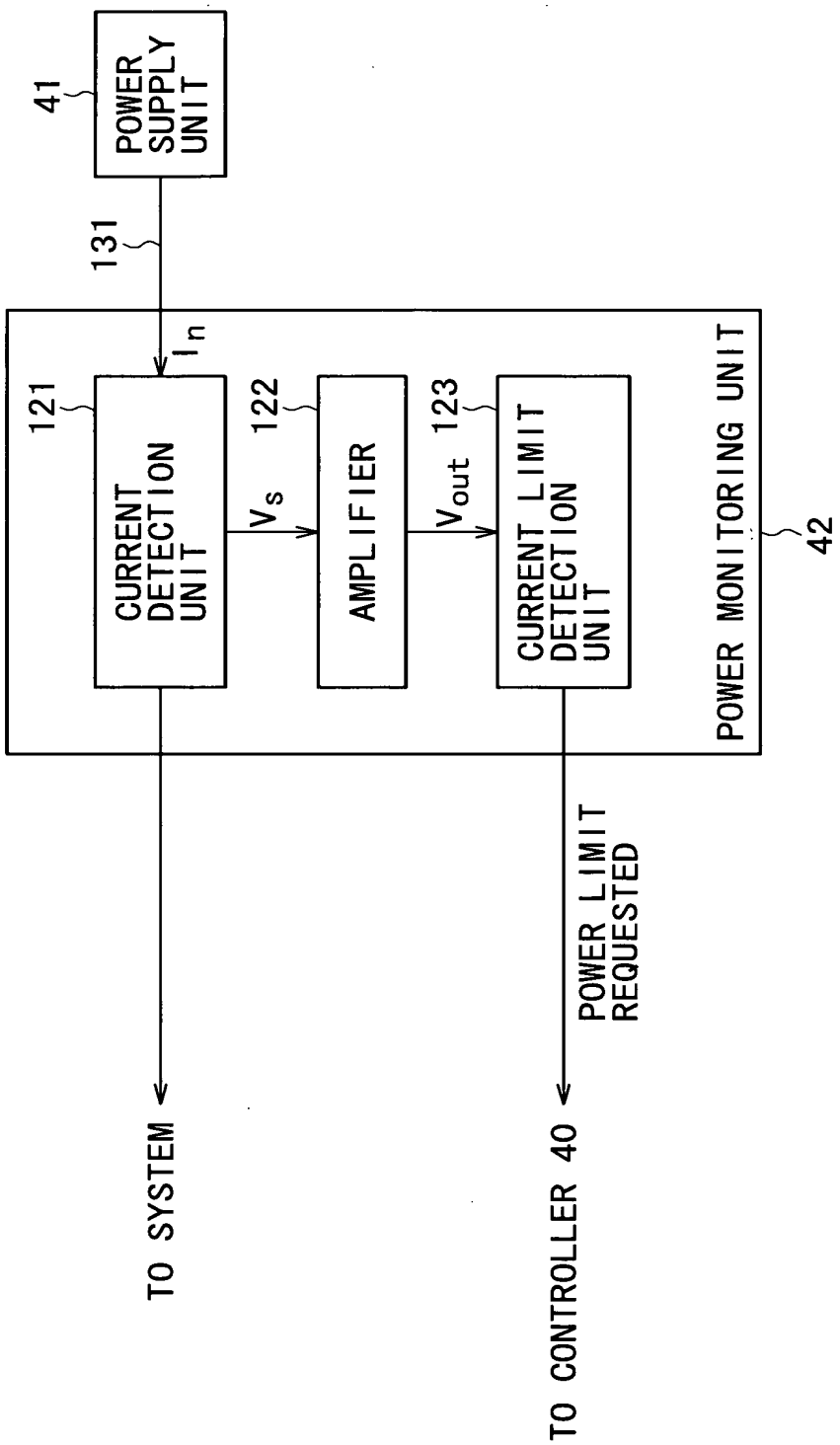

41
POWER SUPPLY UNIT
131
I_n
121
CURRENT DETECTION UNIT
V_s
122
AMPLIFIER
V_{out}
123
CURRENT LIMIT DETECTION UNIT
POWER MONITORING UNIT
42
TO SYSTEM
TO CONTROLLER 40
POWER LIMIT REQUESTED

FIG. 4

CONTROL NAME	PRELIMINARY POWER LIMIT CONTROL	POWER LIMIT CONTROL
POWER LIMIT SETTING UNIT	BY USE OF AML 91 OR BIOS 30 (THE START AND STOP OF CONTROL ARE TRIGGERED WHEN SCI OR SMI IS SIGNALED BY THE CONTROLLER 40)	BY CONTROLLER 40
DESCRIPTION OF POWER LIMIT	THROTTLING CONTROL CONTROL BY TCC MULTISTAGE VOLTAGE SCALING CONTROL	THROTTLING CONTROL

FIG. 5

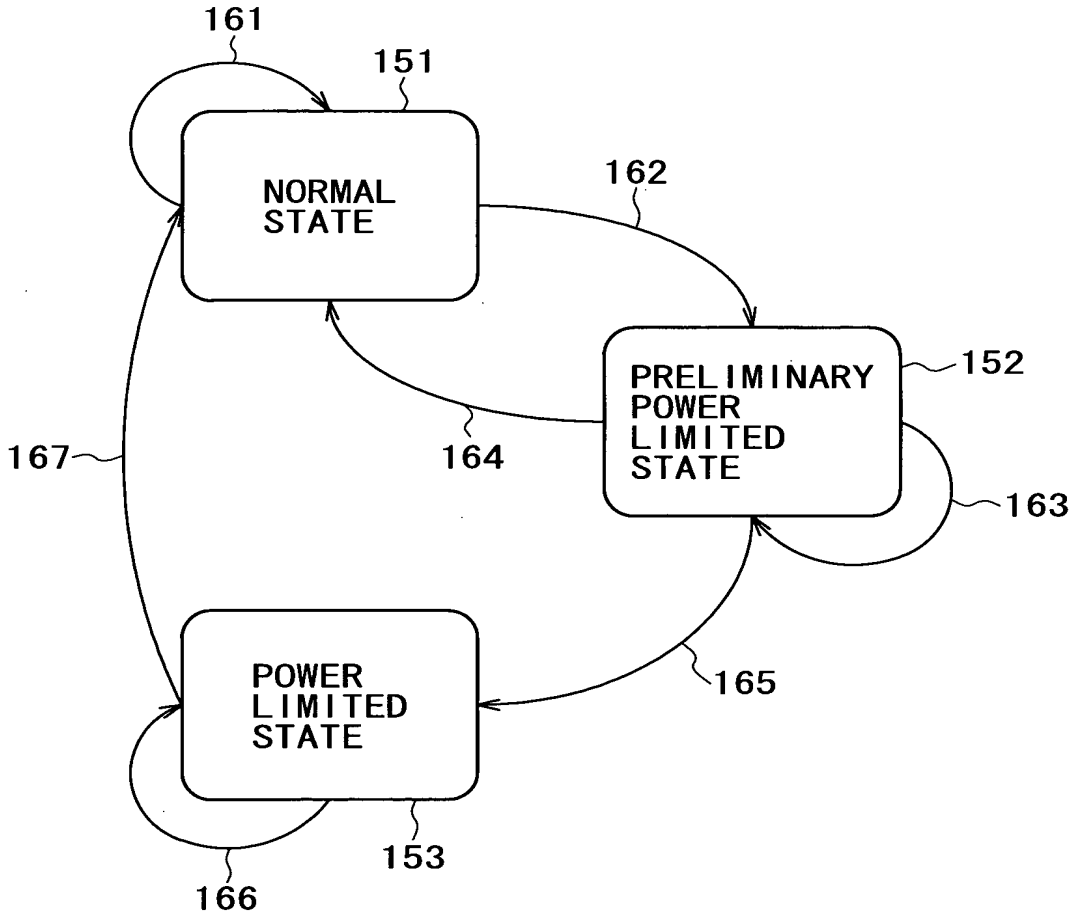

161
151
NORMAL STATE
162
PRELIMINARY POWER LIMITED STATE
152
163
164
167
165
POWER LIMITED STATE
153
166

FIG. 6

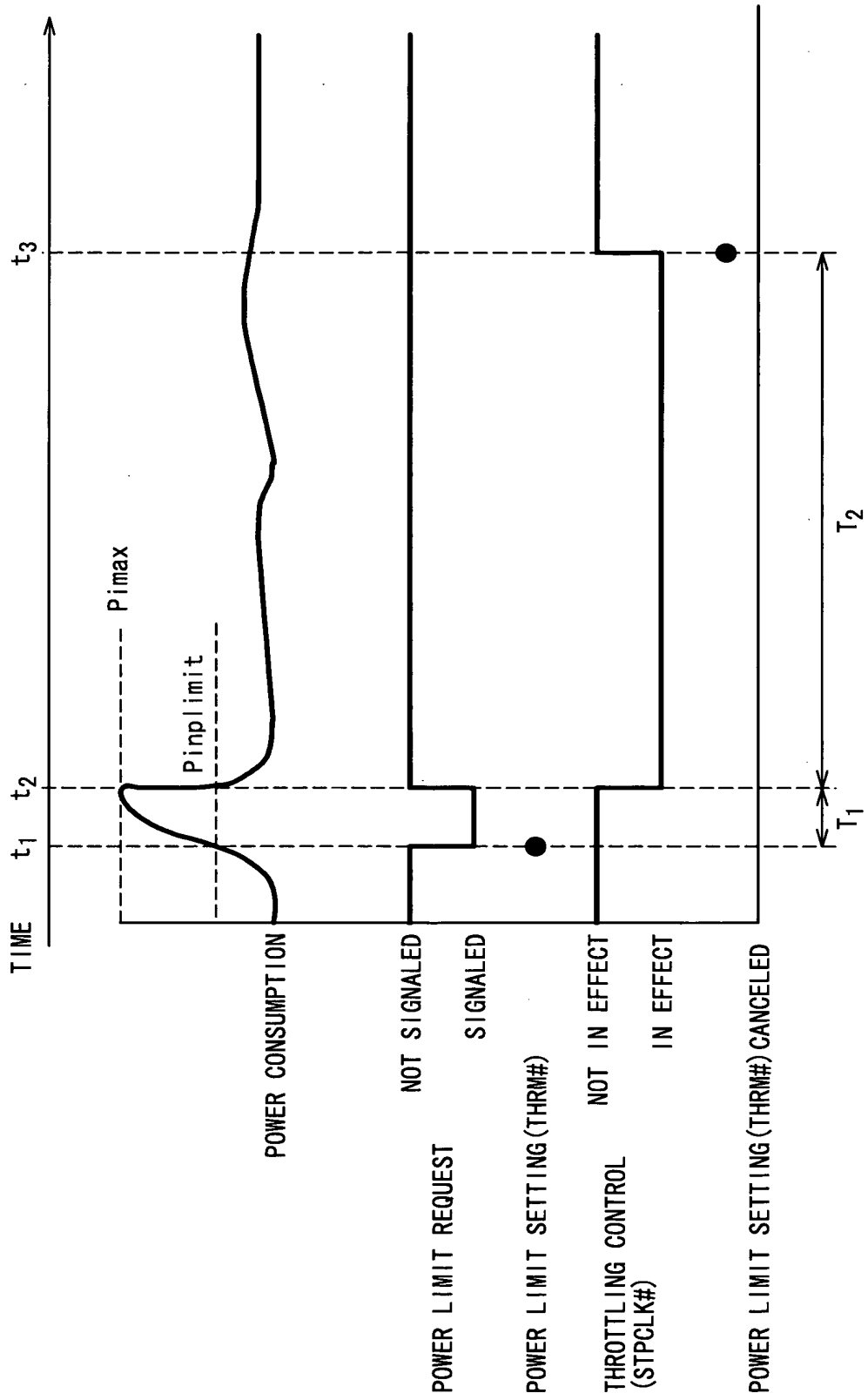

TIME
t1
t2
t3
Pimax
Pinplimit
T1
T2
POWER CONSUMPTION
POWER LIMIT REQUEST
NOT SIGNALED
SIGNALED
POWER LIMIT SETTING(THRM#)
THROTTLING CONTROL (STPCLK#)
NOT IN EFFECT
IN EFFECT
POWER LIMIT SETTING(THRM#) CANCELED

FIG. 7

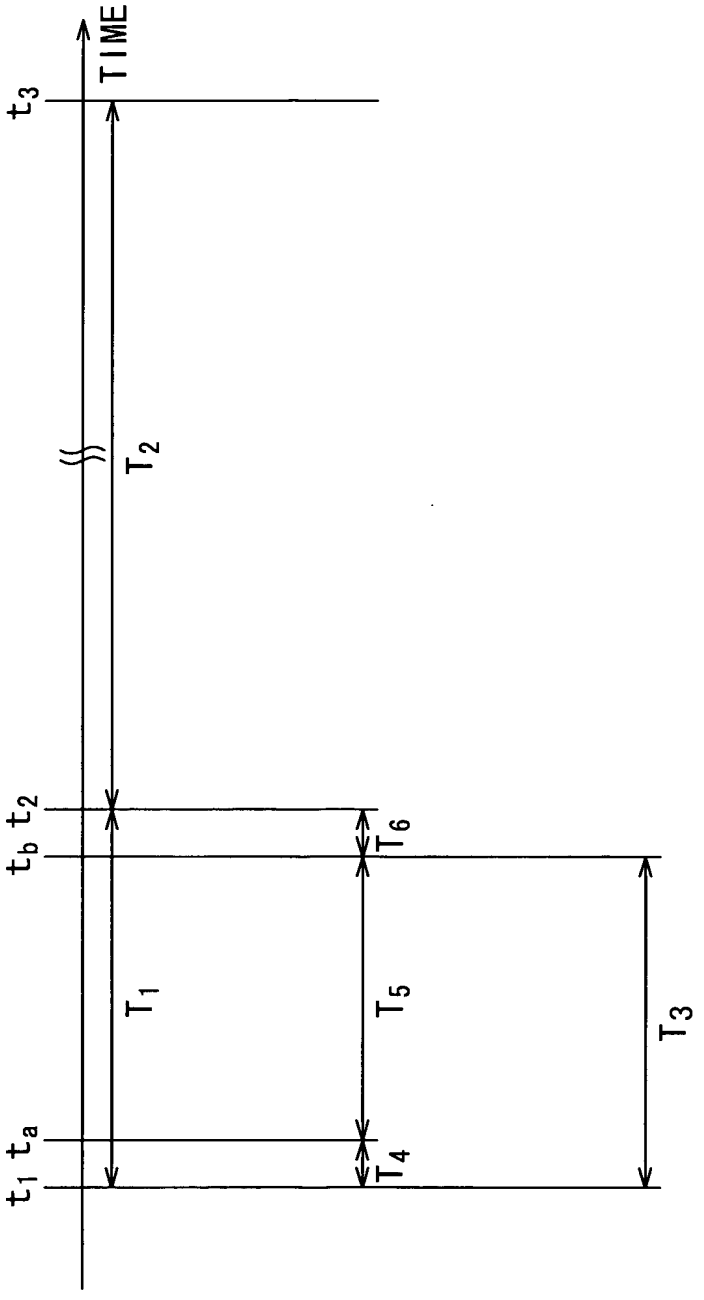


FIG. 8

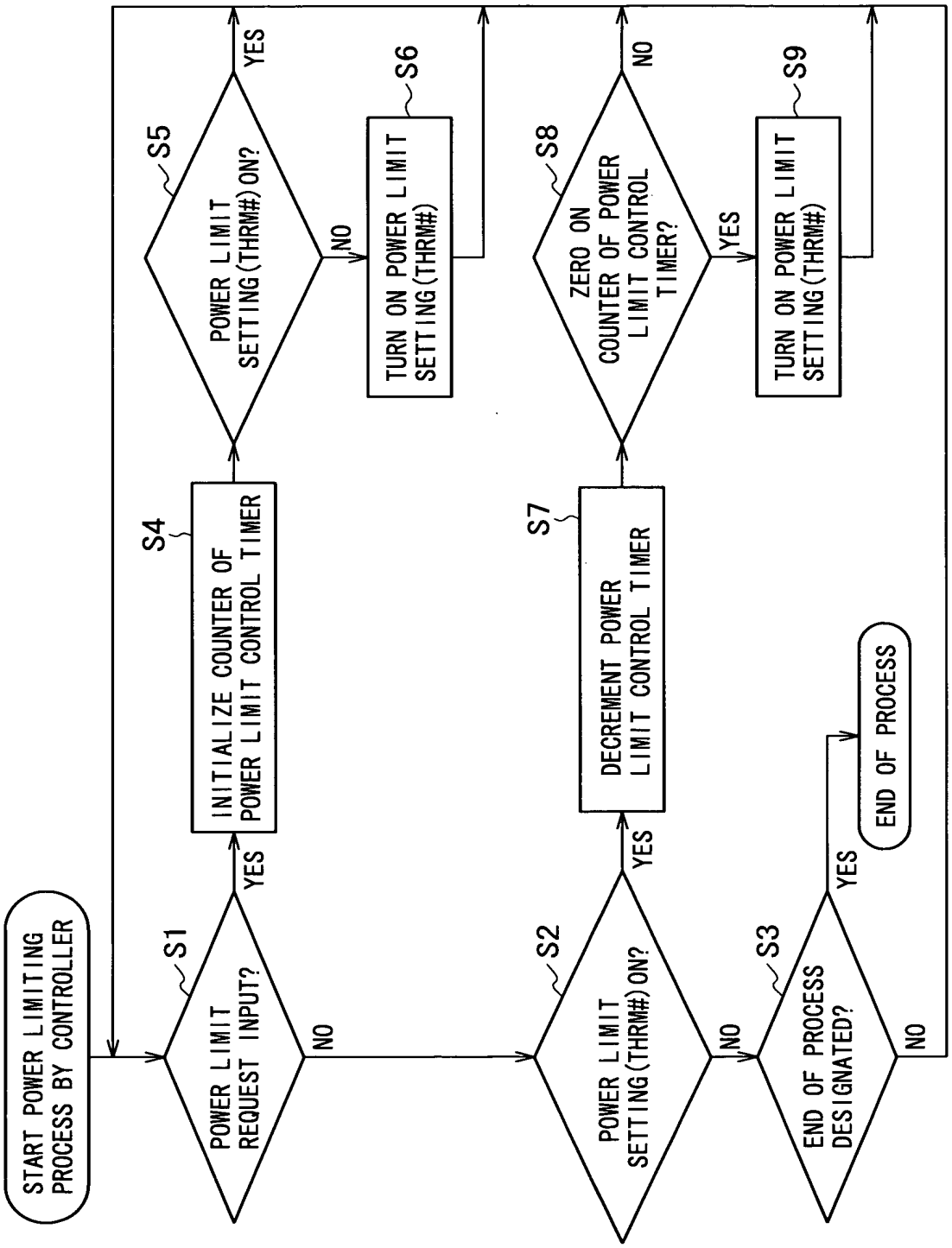

START POWER LIMITING PROCESS BY CONTROLLER
S1
POWER LIMIT REQUEST INPUT?
YES
NO
S4
INITIALIZE COUNTER OF POWER LIMIT CONTROL TIMER
S5
POWER LIMIT SETTING(THRM#) ON?
YES
NO
S6
TURN ON POWER LIMIT SETTING(THRM#)
S2
POWER LIMIT SETTING(THRM#) ON?
YES
NO
S7
DECREMENT POWER LIMIT CONTROL TIMER
S8
ZERO ON COUNTER OF POWER LIMIT CONTROL TIMER?
NO
YES
S9
TURN ON POWER LIMIT SETTING(THRM#)
S3
END OF PROCESS DESIGNATED?
YES
NO
END OF PROCESS

FIG. 9

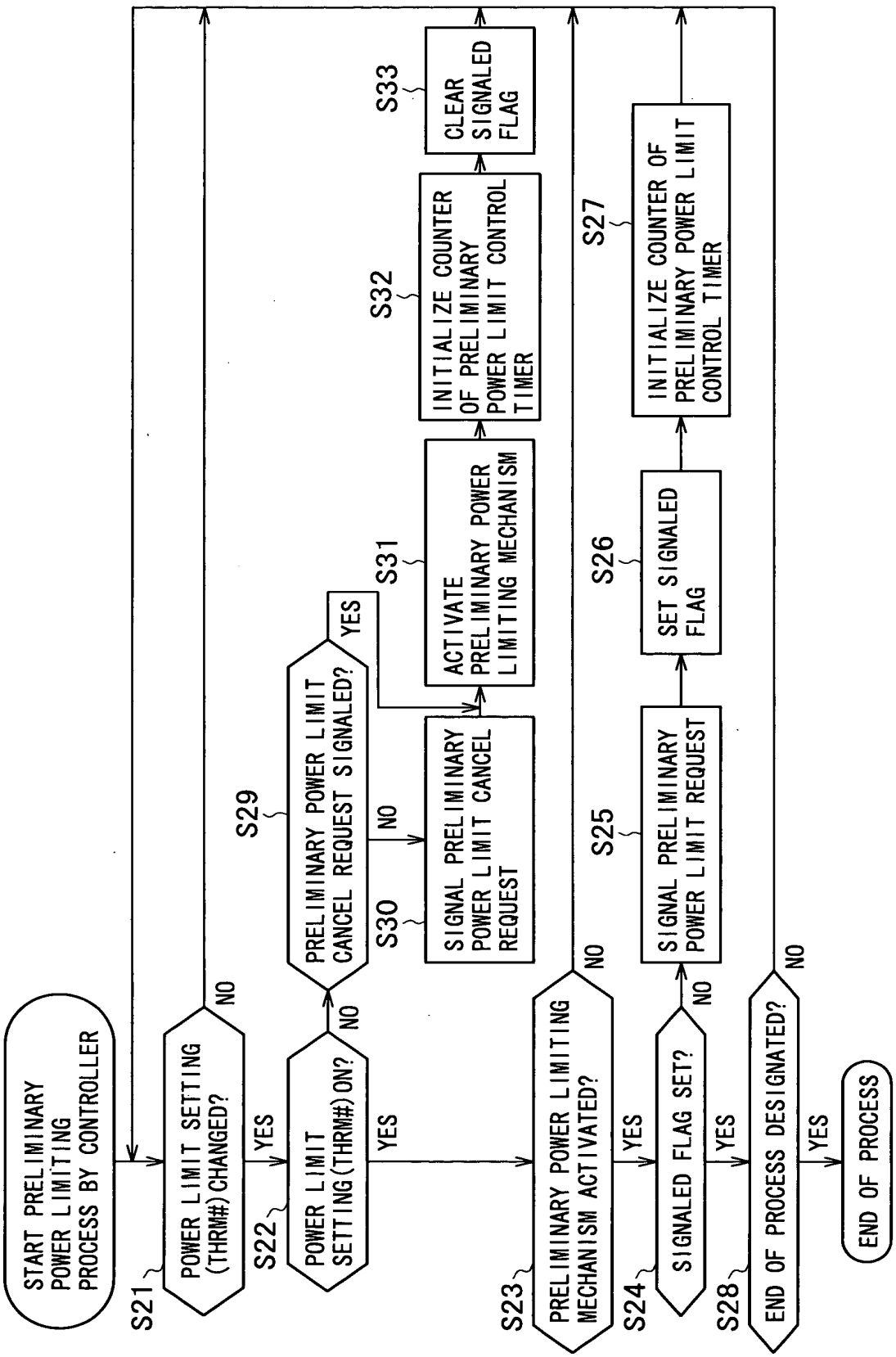

START PRELIMINARY POWER LIMITING PROCESS BY CONTROLLER
S21
POWER LIMIT SETTING (THRM#) CHANGED?
NO
YES
S22
POWER LIMIT SETTING (THRM#) ON?
NO
YES
S29
PRELIMINARY POWER LIMIT CANCEL REQUEST SIGNALED?
NO
YES
S30
SIGNAL PRELIMINARY POWER LIMIT CANCEL REQUEST
S31
ACTIVATE PRELIMINARY POWER LIMITING MECHANISM
S32
INITIALIZE COUNTER OF PRELIMINARY POWER LIMIT CONTROL TIMER
S33
CLEAR SIGNALED FLAG
S23
PRELIMINARY POWER LIMITING MECHANISM ACTIVATED?
NO
YES
S24
SIGNALED FLAG SET?
NO
YES
S25
SIGNAL PRELIMINARY POWER LIMIT REQUEST
S26
SET SIGNALED FLAG
S27
INITIALIZE COUNTER OF PRELIMINARY POWER LIMIT CONTROL TIMER
S28
END OF PROCESS DESIGNATED?
NO
YES
END OF PROCESS

FIG. 10

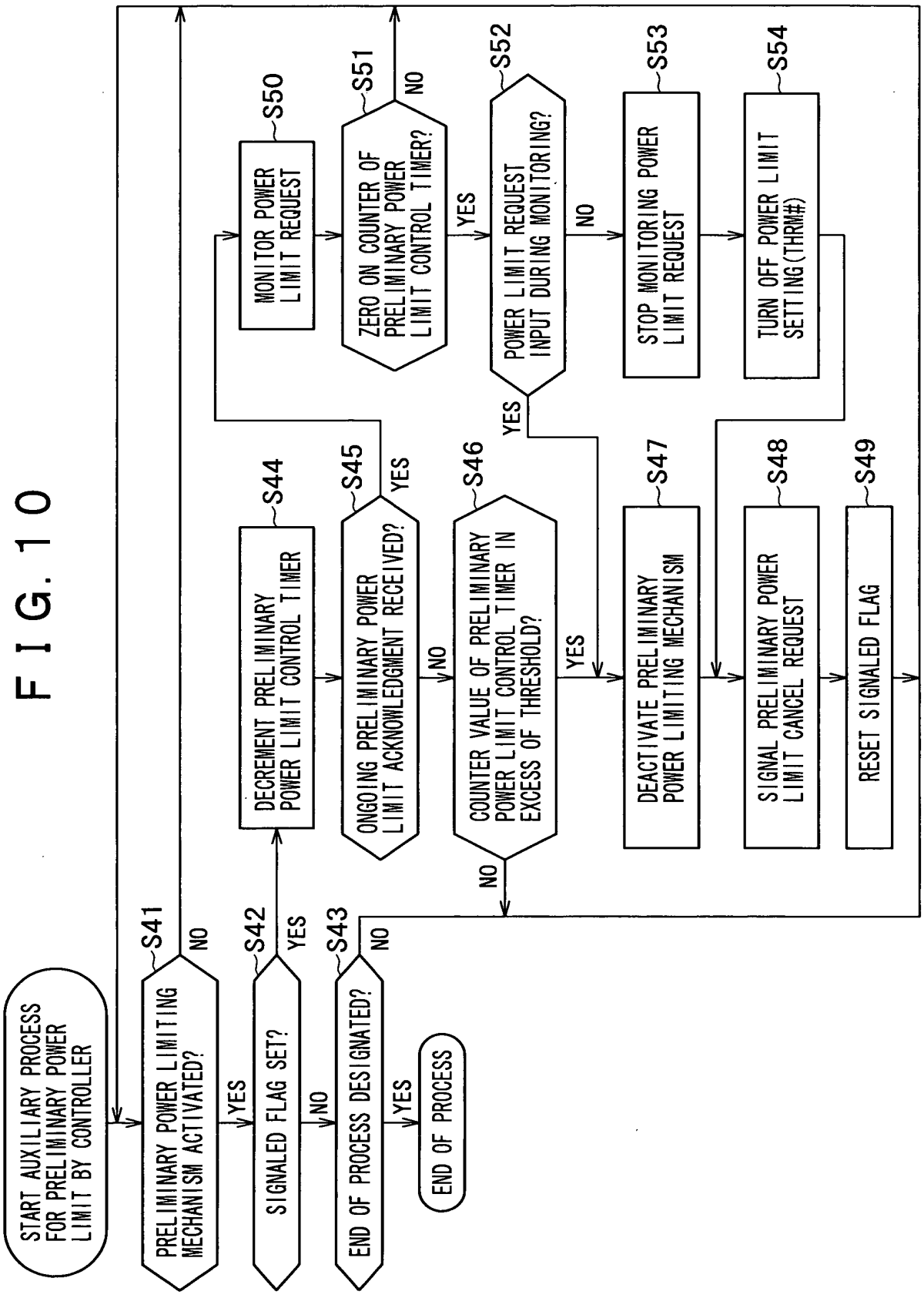

START AUXILIARY PROCESS FOR PRELIMINARY POWER LIMIT BY CONTROLLER
S41
PRELIMINARY POWER LIMITING MECHANISM ACTIVATED?
NO
YES
S42
SIGNALED FLAG SET?
YES
NO
S43
END OF PROCESS DESIGNATED?
NO
YES
END OF PROCESS
S44
DECREMENT PRELIMINARY POWER LIMIT CONTROL TIMER
S45
ONGOING PRELIMINARY POWER LIMIT ACKNOWLEDGMENT RECEIVED?
YES
NO
S46
COUNTER VALUE OF PRELIMINARY POWER LIMIT CONTROL TIMER IN EXCESS OF THRESHOLD?
YES
NO
S47
DEACTIVATE PRELIMINARY POWER LIMITING MECHANISM
S48
SIGNAL PRELIMINARY POWER LIMIT CANCEL REQUEST
S49
RESET SIGNALED FLAG
S50
MONITOR POWER LIMIT REQUEST
S51
ZERO ON COUNTER OF PRELIMINARY POWER LIMIT CONTROL TIMER?
NO
YES
S52
POWER LIMIT REQUEST INPUT DURING MONITORING?
YES
NO
S53
STOP MONITORING POWER LIMIT REQUEST
S54
TURN OFF POWER LIMIT SETTING(THRM#)

FIG. 11

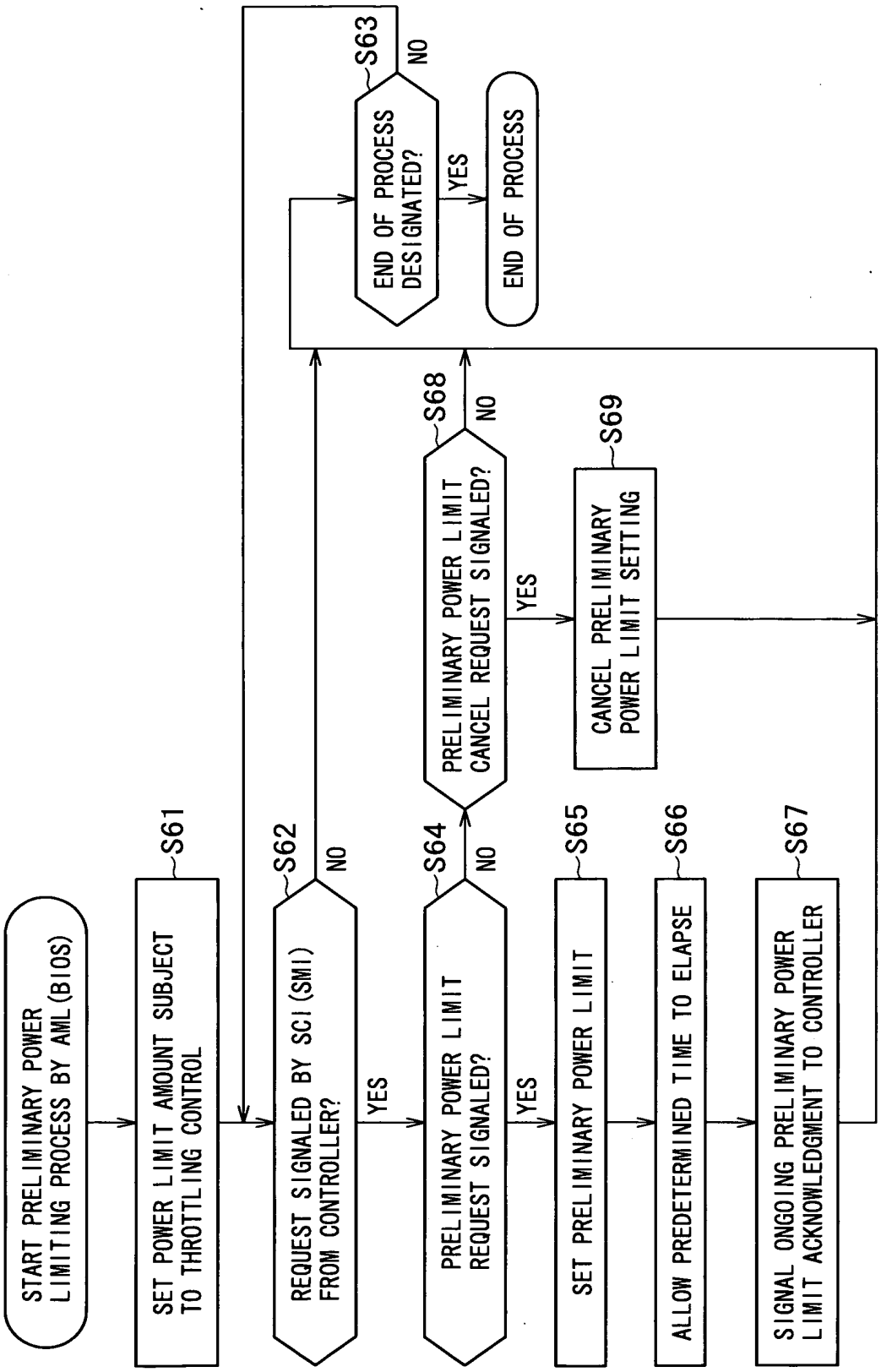

START PRELIMINARY POWER LIMITING PROCESS BY AML (BIOS)
S61
SET POWER LIMIT AMOUNT SUBJECT TO THROTTLING CONTROL
S62
REQUEST SIGNALED BY SCI (SMI) FROM CONTROLLER?
NO
YES
S64
PRELIMINARY POWER LIMIT REQUEST SIGNALED?
NO
YES
S65
SET PRELIMINARY POWER LIMIT
S66
ALLOW PREDETERMINED TIME TO ELAPSE
S67
SIGNAL ONGOING PRELIMINARY POWER LIMIT ACKNOWLEDGMENT TO CONTROLLER
S68
PRELIMINARY POWER LIMIT CANCEL REQUEST SIGNALED?
NO
YES
S69
CANCEL PRELIMINARY POWER LIMIT SETTING
S63
END OF PROCESS DESIGNATED?
NO
YES
END OF PROCESS

FIG. 12

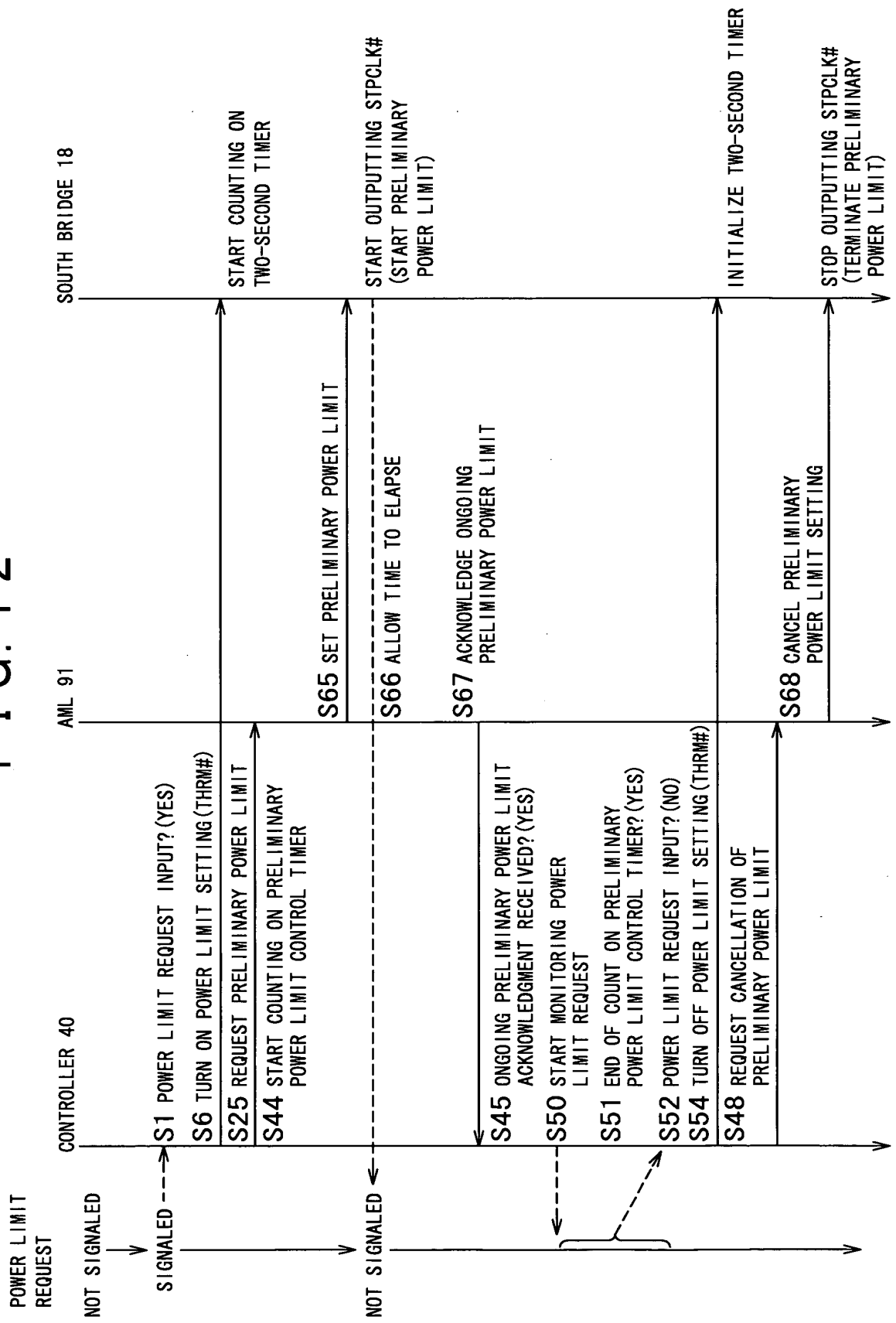

POWER LIMIT REQUEST
NOT SIGNALED
SIGNALED
NOT SIGNALED
CONTROLLER 40
AML 91
SOUTH BRIDGE 18
S1 POWER LIMIT REQUEST INPUT? (YES)
S6 TURN ON POWER LIMIT SETTING (THRM#)
S25 REQUEST PRELIMINARY POWER LIMIT
S44 START COUNTING ON PRELIMINARY POWER LIMIT CONTROL TIMER
START COUNTING ON TWO-SECOND TIMER
S65 SET PRELIMINARY POWER LIMIT
START OUTPUTTING STPCLK# (START PRELIMINARY POWER LIMIT)
S66 ALLOW TIME TO ELAPSE
S67 ACKNOWLEDGE ONGOING PRELIMINARY POWER LIMIT
S45 ONGOING PRELIMINARY POWER LIMIT ACKNOWLEDGMENT RECEIVED? (YES)
S50 START MONITORING POWER LIMIT REQUEST
S51 END OF COUNT ON PRELIMINARY POWER LIMIT CONTROL TIMER? (YES)
S52 POWER LIMIT REQUEST INPUT? (NO)
S54 TURN OFF POWER LIMIT SETTING (THRM#)
S48 REQUEST CANCELLATION OF PRELIMINARY POWER LIMIT
INITIALIZE TWO-SECOND TIMER
S68 CANCEL PRELIMINARY POWER LIMIT SETTING
STOP OUTPUTTING STPCLK# (TERMINATE PRELIMINARY POWER LIMIT)

FIG. 13

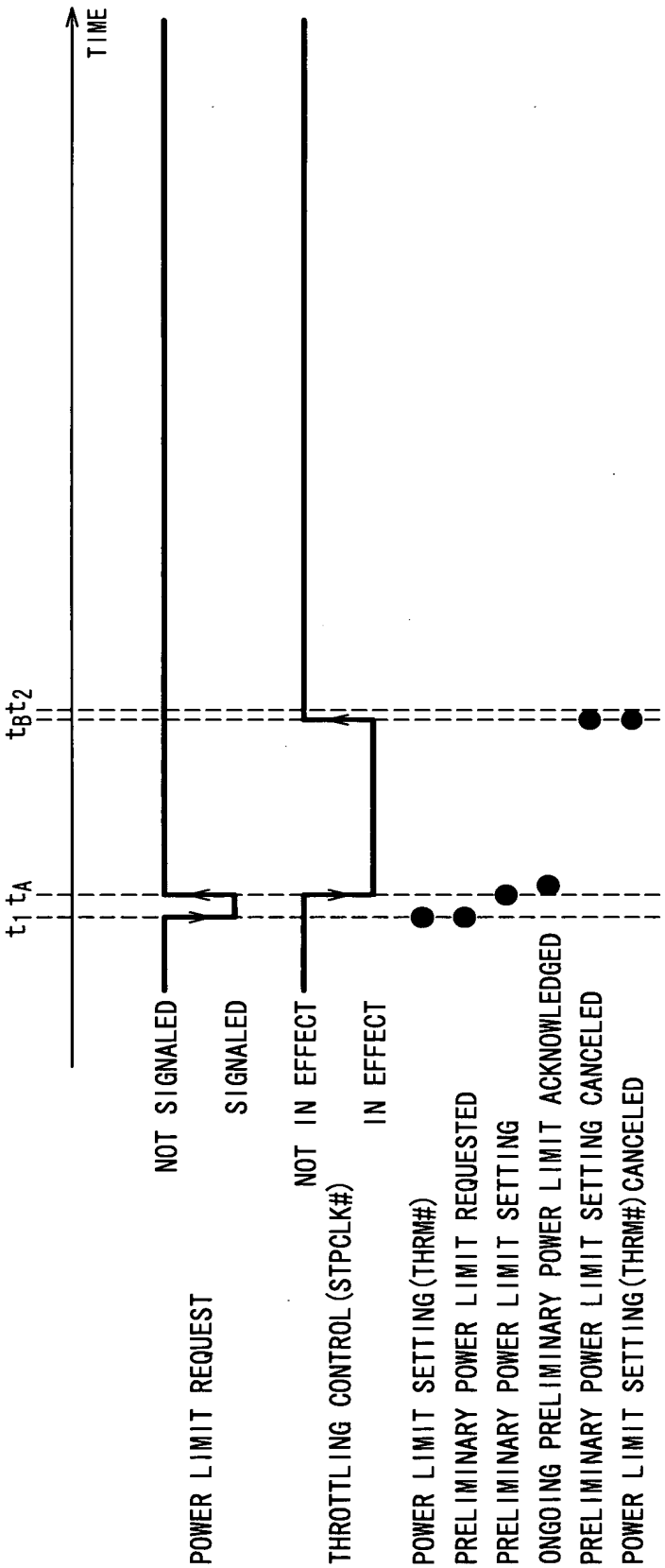

TIME
t_1 t_A
t_B t_2
POWER LIMIT REQUEST
NOT SIGNALED
SIGNALED
THROTTLING CONTROL (STPCLK#)
NOT IN EFFECT
IN EFFECT
POWER LIMIT SETTING (THRM#)
PRELIMINARY POWER LIMIT REQUESTED
PRELIMINARY POWER LIMIT SETTING
ONGOING PRELIMINARY POWER LIMIT ACKNOWLEDGED
PRELIMINARY POWER LIMIT SETTING CANCELED
POWER LIMIT SETTING (THRM#) CANCELED

FIG. 14

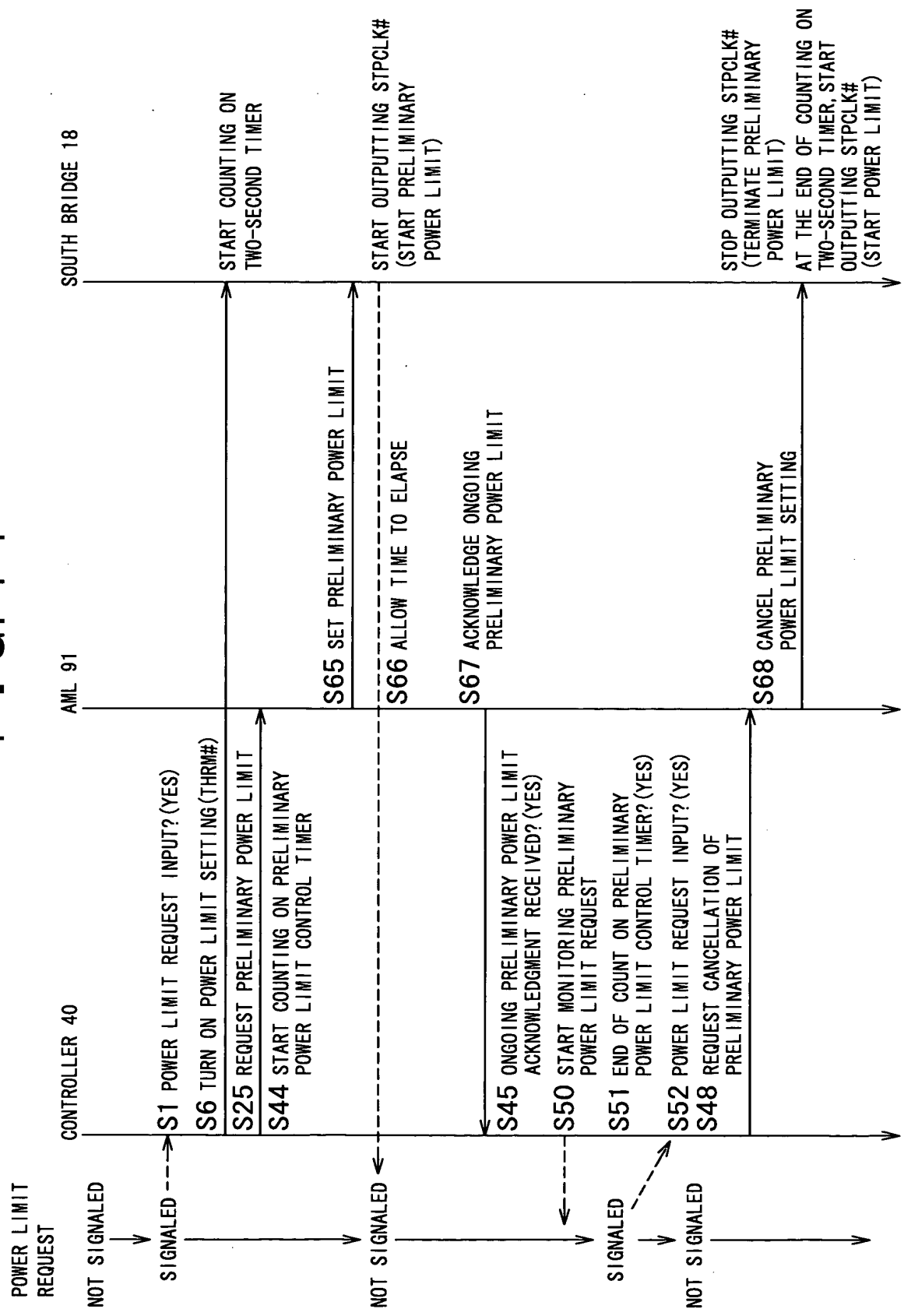

POWER LIMIT REQUEST
NOT SIGNALED
SIGNALED
NOT SIGNALED
SIGNALED
NOT SIGNALED
CONTROLLER 40
AML 91
SOUTH BRIDGE 18
S1 POWER LIMIT REQUEST INPUT? (YES)
S6 TURN ON POWER LIMIT SETTING (THRM#)
S25 REQUEST PRELIMINARY POWER LIMIT
S44 START COUNTING ON PRELIMINARY POWER LIMIT CONTROL TIMER
START COUNTING ON TWO-SECOND TIMER
S65 SET PRELIMINARY POWER LIMIT
START OUTPUTTING STPCLK# (START PRELIMINARY POWER LIMIT)
S66 ALLOW TIME TO ELAPSE
S67 ACKNOWLEDGE ONGOING PRELIMINARY POWER LIMIT
S45 ONGOING PRELIMINARY POWER LIMIT ACKNOWLEDGMENT RECEIVED? (YES)
S50 START MONITORING PRELIMINARY POWER LIMIT REQUEST
S51 END OF COUNT ON PRELIMINARY POWER LIMIT CONTROL TIMER? (YES)
S52 POWER LIMIT REQUEST INPUT? (YES)
S48 REQUEST CANCELLATION OF PRELIMINARY POWER LIMIT
S68 CANCEL PRELIMINARY POWER LIMIT SETTING
STOP OUTPUTTING STPCLK# (TERMINATE PRELIMINARY POWER LIMIT)
AT THE END OF COUNTING ON TWO-SECOND TIMER, START OUTPUTTING STPCLK# (START POWER LIMIT)

FIG. 15

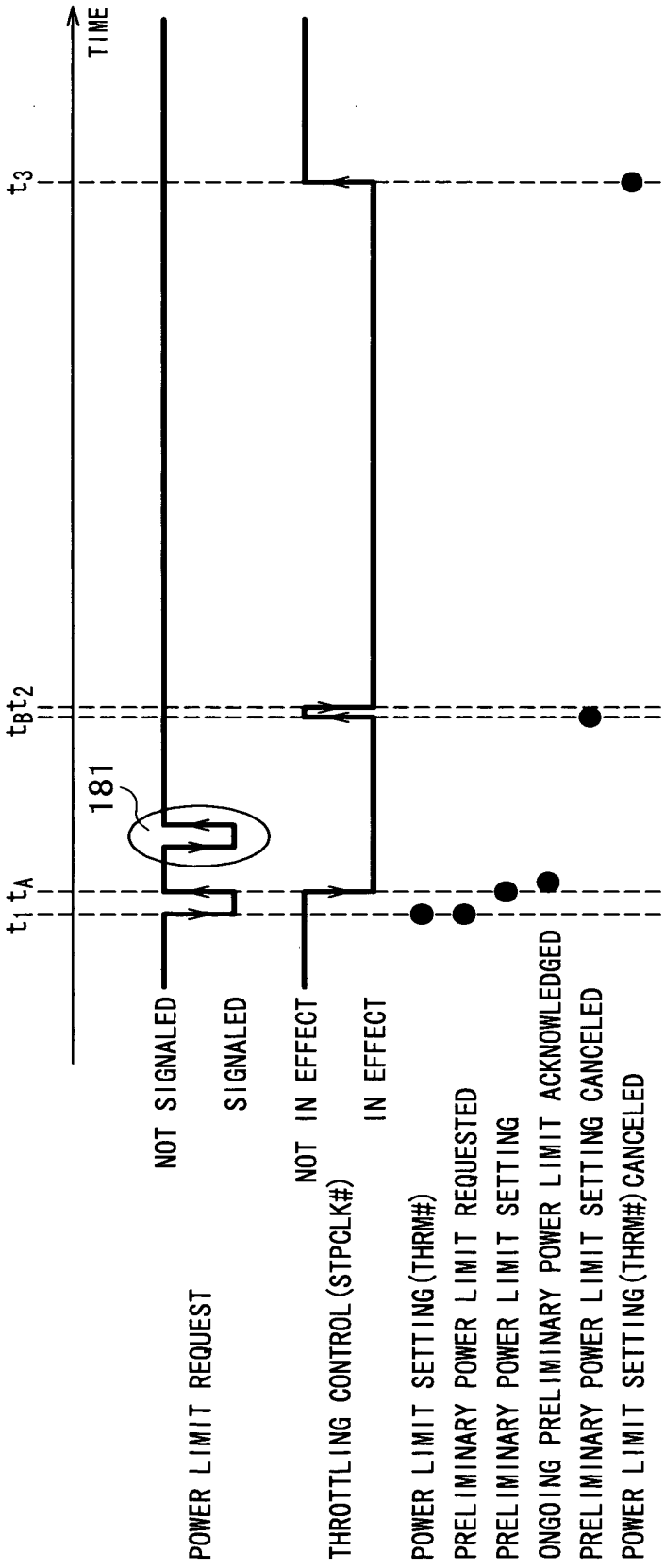

TIME
t3
tBt2
181
t1 tA
NOT SIGNALED
SIGNALED
NOT IN EFFECT
IN EFFECT
POWER LIMIT REQUEST
THROTTLING CONTROL (STPCLK#)
POWER LIMIT SETTING (THRM#)
PRELIMINARY POWER LIMIT REQUESTED
PRELIMINARY POWER LIMIT SETTING
ONGOING PRELIMINARY POWER LIMIT ACKNOWLEDGED
PRELIMINARY POWER LIMIT SETTING CANCELED
POWER LIMIT SETTING (THRM#) CANCELED

FIG. 16

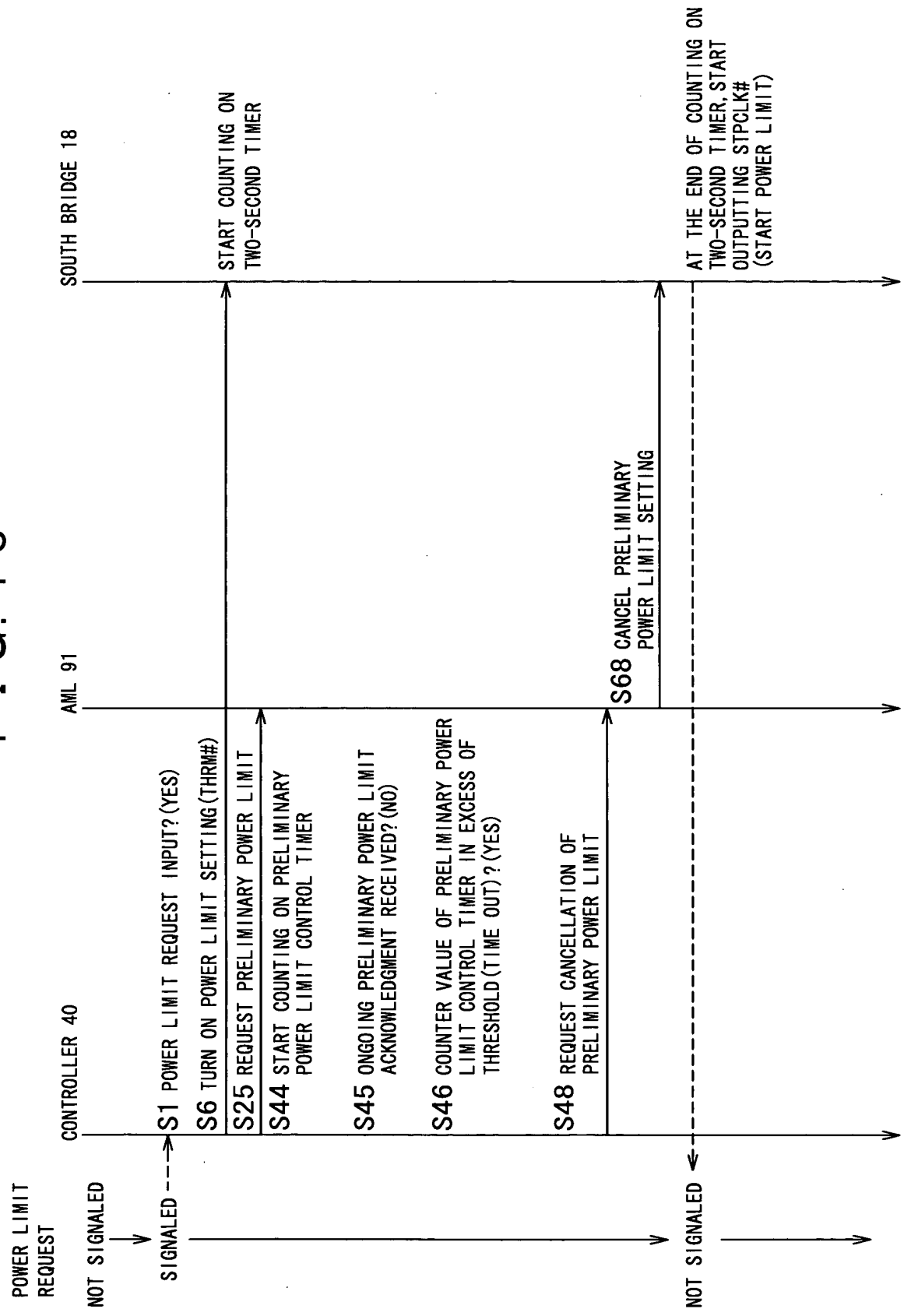

POWER LIMIT REQUEST
NOT SIGNALED
SIGNALED
NOT SIGNALED
CONTROLLER 40
AML 91
SOUTH BRIDGE 18
S1 POWER LIMIT REQUEST INPUT? (YES)
S6 TURN ON POWER LIMIT SETTING (THRM#)
START COUNTING ON TWO-SECOND TIMER
S25 REQUEST PRELIMINARY POWER LIMIT
S44 START COUNTING ON PRELIMINARY POWER LIMIT CONTROL TIMER
S45 ONGOING PRELIMINARY POWER LIMIT ACKNOWLEDGMENT RECEIVED? (NO)
S46 COUNTER VALUE OF PRELIMINARY POWER LIMIT CONTROL TIMER IN EXCESS OF THRESHOLD (TIME OUT)? (YES)
S48 REQUEST CANCELLATION OF PRELIMINARY POWER LIMIT
S68 CANCEL PRELIMINARY POWER LIMIT SETTING
AT THE END OF COUNTING ON TWO-SECOND TIMER, START OUTPUTTING STPCLK# (START POWER LIMIT)

FIG. 17

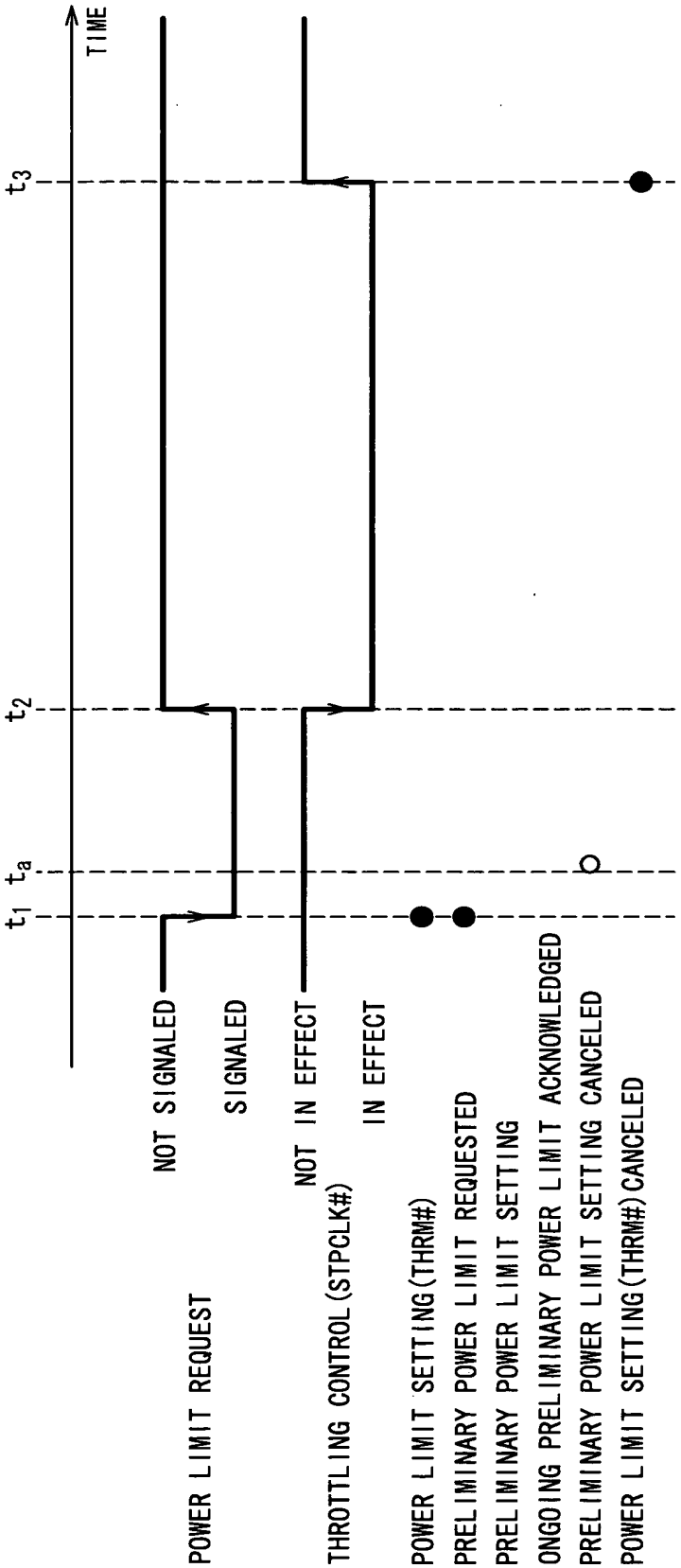

TIME
t1
ta
t2
t3
POWER LIMIT REQUEST
NOT SIGNALED
SIGNALED
THROTTLING CONTROL (STPCLK#)
NOT IN EFFECT
IN EFFECT
POWER LIMIT SETTING (THRM#)
PRELIMINARY POWER LIMIT REQUESTED
PRELIMINARY POWER LIMIT SETTING
ONGOING PRELIMINARY POWER LIMIT ACKNOWLEDGED
PRELIMINARY POWER LIMIT SETTING CANCELED
POWER LIMIT SETTING (THRM#) CANCELED

FIG. 18

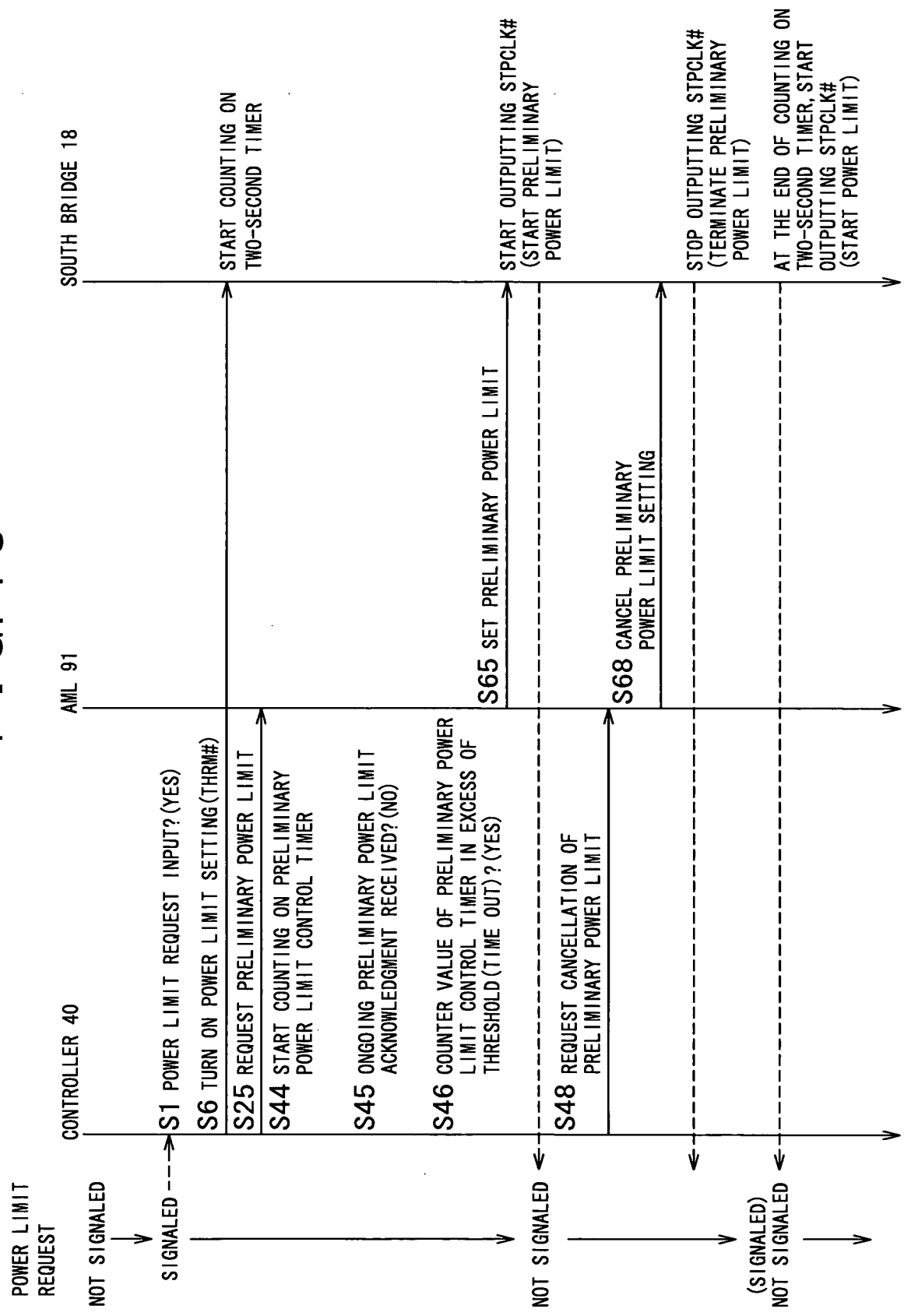
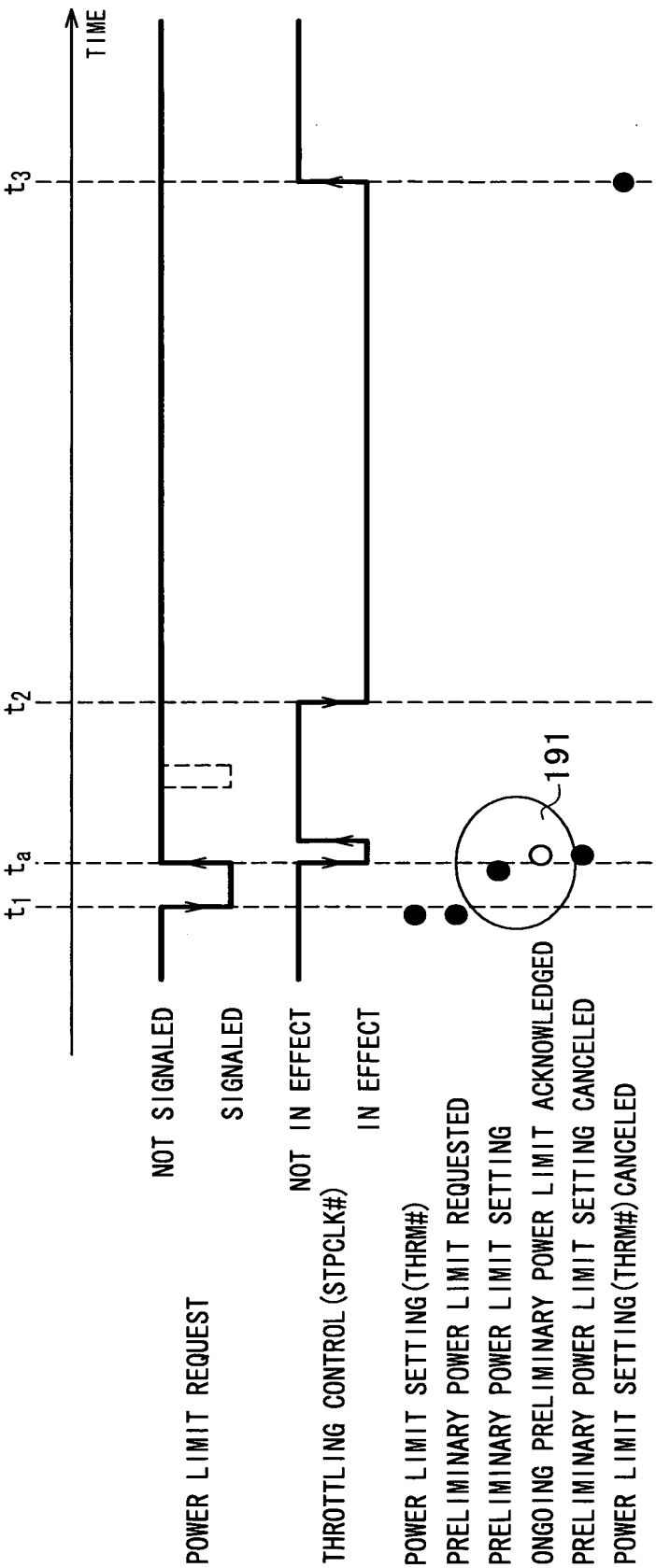

POWER LIMIT REQUEST
NOT SIGNALED
SIGNALED
NOT SIGNALED
(SIGNALED)
NOT SIGNALED
CONTROLLER 40
AML 91
SOUTH BRIDGE 18
S1 POWER LIMIT REQUEST INPUT? (YES)
S6 TURN ON POWER LIMIT SETTING (THRM#)
START COUNTING ON TWO-SECOND TIMER
S25 REQUEST PRELIMINARY POWER LIMIT
S44 START COUNTING ON PRELIMINARY POWER LIMIT CONTROL TIMER
S45 ONGOING PRELIMINARY POWER LIMIT ACKNOWLEDGMENT RECEIVED? (NO)
S46 COUNTER VALUE OF PRELIMINARY POWER LIMIT CONTROL TIMER IN EXCESS OF THRESHOLD (TIME OUT)? (YES)
S65 SET PRELIMINARY POWER LIMIT
START OUTPUTTING STPCLK# (START PRELIMINARY POWER LIMIT)
S48 REQUEST CANCELLATION OF PRELIMINARY POWER LIMIT
S68 CANCEL PRELIMINARY POWER LIMIT SETTING
STOP OUTPUTTING STPCLK# (TERMINATE PRELIMINARY POWER LIMIT)
AT THE END OF COUNTING ON TWO-SECOND TIMER, START OUTPUTTING STPCLK# (START POWER LIMIT)

FIG. 19


TIME
t_1
t_a
t_2
t_3
191
POWER LIMIT REQUEST
NOT SIGNALED
SIGNALED
THROTTLING CONTROL (STPCLK#)
NOT IN EFFECT
IN EFFECT
POWER LIMIT SETTING (THRM#)
PRELIMINARY POWER LIMIT REQUESTED
PRELIMINARY POWER LIMIT SETTING
ONGOING PRELIMINARY POWER LIMIT ACKNOWLEDGED
PRELIMINARY POWER LIMIT SETTING CANCELED
POWER LIMIT SETTING (THRM#) CANCELED